Preface

The thesis is divided into two parts. The first part deals with the research work carried out on the synthesis and chemical modification of nanomaterials whereas the second part describes the preparation and characterisation of polymer films and their use as separation membranes.

Part I of the thesis describing the synthetic strategies and chemical manipulation schemes employed on various types of nanomaterials is divided into six chapters. **Chapter 1** describes a chemist's approach towards synthesizing and tuning the properties of different classes of nanomaterials along with a brief account of their potential applications. **Chapter 2** of the thesis describes the synthesis and characterization of various metal nanostructures (viz. nanoparticles, nanorods, nanosheets etc.) of nickel, ruthenium, rhodium and iridium using a solvothermal procedure. **Chapter 3** deals with the nanoparticles of the novel oxide metal ReO_3. ReO_3@Au, ReO_3@Ag, ReO_3@SiO_2 and ReO_3@TiO_2 core-shell nanostructures with ReO_3 as the core nanoparticle have been synthesized through a two-step process and characterized. Dependence of the plasmon band of the ReO_3 nanoparticles on the interparticle separation has been examined by incorporating the nanoparticles in various polymer matrices and the results compared with those obtained with gold nanoparticles. **Chapter 4** presents the dispersion of nanostructures of metal oxides such as TiO_2, Fe_3O_4 and ZnO in solvents of differing polarity (water, DMF and toluene) in the presence of several surfactants. In **Chapter 5** of the thesis, fluorous chemical method of separation of metallic and semiconducting single-walled carbon nanotubes is described. This method involves the selective reaction of the diazonium salt of a fluorous aniline with the metallic nanotubes in an aqueous medium and subsequent extraction of the same in a fluorous solvent leaving the semiconducting nanotubes in the aqueous layer. **Chapter 6** presents the studies on the interaction of single walled nanotubes and graphene with various halogen molecules (I_2, IBr, ICl and Br_2) of vary-

ing electron affinity probed by employing Raman spectroscopy and electronic absorption spectroscopy.

Part II of the thesis describes a general method of fabricating ultrathin free-standing cross-linked polymer films and their subsequent use as separation membranes. A particular class of 1-D nanomaterials namely cadmium hydroxide nanostrands were used in this method throughout, to generate a sacrificial layer upon which the polymer films were generated.